

Claims

- [c1] An apparatus comprising:
one or more housing sections providing a sealed space;
a first explosive element in the sealed space;
a second explosive element having a first portion inside the sealed space, and a second portion outside the sealed space exposed to outside pressure; and
a gripping mechanism to grip a surface of the second explosive element to maintain a position of the second explosive element that is exposed to the outside pressure in an axial direction of the second explosive element.
- [c2] The apparatus of claim 1, wherein an inner surface of a first one of the one or more housing sections is contacted to the second explosive element to provide sealing engagement between the first housing section and the second explosive element.
- [c3] The apparatus of claim 2, wherein the first housing section comprises a boot formed of an elastic material, the boot contacted to the second explosive element.
- [c4] The apparatus of claim 3, wherein the elastic material

comprises an elastomer.

- [c5] The apparatus of claim 3, wherein the one or more housing sections further comprise a hard housing section to house the first explosive element.
- [c6] The apparatus of claim 5, wherein the first explosive element in the hard housing section comprises a detonator explosive.
- [c7] The apparatus of claim 6, wherein the second explosive element comprises a detonating cord.
- [c8] The apparatus of claim 7, further comprising a booster explosive provided in the sealed space and ballistically connected between the detonator explosive and the detonating cord.
- [c9] The apparatus of claim 3, wherein the gripping mechanism comprises a grip tube having an inner space through which the second explosive element extends, the grip tube having a roughened inner surface to grip an outer surface of the second explosive element.
- [c10] The apparatus of claim 9, wherein the gripping mechanism further comprises a crimping shell to grip the second explosive element.
- [c11] The apparatus of claim 10, wherein the crimping shell is

adapted to anchor the second explosive element at a first pressure, and the grip tube is adapted to anchor the second explosive element at a second pressure, the second pressure greater than the first pressure.

- [c12] The apparatus of claim 11, wherein the grip tube is adapted to collapse at greater than a predetermined pressure, wherein collapse of the grip tube causes the grip tube to grip the second explosive element.
- [c13] The apparatus of claim 10, wherein the boot comprises an inner chamber in which the grip tube and crimping shell are located.
- [c14] The apparatus of claim 9, wherein the boot comprises an inner chamber in which the grip tube and crimping shell are located.
- [c15] The apparatus of claim 1, further comprising a well tool adapted to be activated by detonation of the first and second explosive elements.
- [c16] The apparatus of claim 1, further comprising a perforating gun to be activated by detonation of the first and second explosive elements.
- [c17] A detonator assembly comprising:
a detonator;

a detonating cord ballistically coupled to the detonator, wherein at least a portion of the detonating cord is exposed to pressure external to the detonator assembly; and

a gripping mechanism to grip the detonating cord to maintain a position of the detonating cord along a longitudinal axis of the detonating cord despite presence of the outside pressure acting on the detonating cord.

[c18] The detonator of assembly of claim 17, further comprising one or more housing sections to provide a sealed space, wherein the detonator is in the sealed space, and wherein a first portion of the detonating cord is in the sealed space, and a second portion of the detonating cord is exposed to the outside pressure.

[c19] The detonator assembly of claim 18, wherein the one or more housing sections include an elastic boot to sealably contact a surface of the detonating cord to prevent the outside pressure from being communicated to the sealed space.

[c20] The detonator assembly of claim 19, wherein the gripping mechanism includes a grip member having an inner space through which the detonating cord extends, the grip member adapted to be collapsed by the outside pressure to enable the grip member to grippingly engage

a surface of the detonating cord.

[c21] The detonator assembly of claim 17, further comprising a booster explosive ballistically connected between the detonator and the detonating cord.

[c22] A method for reliable activation of an explosive in a presence of outside pressure, comprising:
providing one or more housing sections defining a sealed space;
providing a first explosive element in the sealed space;
providing a second explosive element having a first portion inside a sealed space, and a second portion outside the sealed space exposed to the outside pressure; and
maintaining an axial position of the second explosive element in an axial direction of the second explosive element to reduce compaction of the second explosive element due to the outside pressure.

[c23] The method of claim 22, wherein maintaining the axial position of the second explosive element is accomplished by using a gripping mechanism that is activated by the outside pressure.

[c24] The method of claim 23, wherein the gripping mechanism includes a grip member containing a space through which the second explosive element extends, the

method further comprising collapsing the grip member onto the second explosive element in response to presence of the outside pressure.

- [c25] The method of claim 24, wherein the one or more housing sections comprise an elastomer housing section that sealingly engages the second explosive element to prevent the outside pressure from being communicated to the sealed space, and wherein the outside pressure acts on the elastomer housing section to collapse the grip member.
- [c26] The method of claim 22, further comprising initiating the first explosive element to cause initiation of the second explosive element, wherein initiation of the first and second explosive elements is conducted at ambient pressure in the sealed space.
- [c27] The method of claim 26, wherein initiating the first and second explosive elements comprises initiating a detonator explosive and a detonating cord.
- [c28] The method of claim 27, further comprising providing a booster explosive ballistically connected between the detonator explosive and the detonating cord.
- [c29] The method of claim 22, further comprising initiating the first and second explosive elements to activate a perfo-

rating gun.

[c30] The method of claim 22, further comprising initiating the first and second explosive elements to activate a well tool.